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Cutaneous Manifestations of Canine Hypothyroidism

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Hypothyroidism is but one of the endocrine disturbances which may result in dermatosis. The interrelationships of the various endocrine organs, as far as is known, is extremely complex. Dermatologic manifestations may result from malfunctions of the pituitary, adrenals and gonads as well as the thyroid. Concomitant malfunction of two or more endocrine glands may compound the difficulty of diagnosis and treatment. For example, in the male dog, hypogonadism may be seen with hypothyroidism. This paper is presented as a review of the clinical picture one may see as a result of primary hypothyroidism. Acanthosis nigricans, although a hypothyroid condition resulting from inadequate production of thyroid stimulating hormone, will not be considered here. Although the primary complaint in hypothyroidism is the loss of hair, it should be remembered that other organ systems are also affected. While we may use the response seen in the skin as our guide, we should not forget the overall metabolic effect of thyroid hormone. The entire well being of the animal patient should always be watched and guarded.

THE THYROID HORMONES

The first iodinated amino acid isolated from the thyroid gland was called *thyroxin* and occurred in 1915. Since that time several other derivatives or related compounds, many with hormonal activity, have been identified. In addition to thyroxin (T_4), these include triiodothyronine (T_3), mono- and di- iodotyrosine (MIT and DIT, respectively). T_3 and T_4 result from the conjugation of MIT and DIT. (2)

Thyroglobulin is the storage site and probably the area of production of the hormones. (2, 3, 10) Desiccated thyroid contains about 0.2% iodine, the main organic iodine being thyroglobulin. Thyroglobulin is composed of many amino acids. Formation of thyroid hormones involves the "trapping" of iodide, conversion to elemental iodine, the union of iodine with tyrosine and the coupling of iodinated tyrosines. There is evidence that production of thyroid hormones may occur in tissues other than thyroid gland (3) but more recent work demonstrates that this is not the case with low to moderate iodine intake (10).

The pituitary secretion of thyroid stimulating hormone causes the release of thyroid hormone. The chief secretion of the thyroid gland is T_4. T_3 and T_4 have nearly identical overall metabolic effects but that of T_3 is more rapid. However, by the oral route, there is insignificant absorption of T_4 by the gastric mucosa and only 20–25% absorption through the small and large intestine. (1)

The total mechanism of action of the thyroid hormones is unknown. Evidence suggests that T_3 and T_4 act to uncouple oxidative phosphorylation and thereby make available energy that would otherwise be stored in high energy phosphorus compounds. (8).

Products that have been used in the treatment of hypothyroidism include desiccated thyroid, thyroxin, purified thyroglobulin (Proloid, Warner-Chilcott), and triiodothyronine (Cytobin, Norden).

CLINICAL HYPOTHYROIDISM

The canine patient afflicted with hypothyroidism is usually obese and somewhat

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lethargic. Contrary to the human being, myxedema does not seem to occur in the dog. Bilateral, symmetrical alopecia occurs and the skin is dry and scaly.

Hyperkeratosis and hyperpigmentation follow, sometimes accompanied with papule formation. These changes may first occur in friction sites, such as the axillary, inguinal or "collar wear" areas. Most frequently, the affected areas seem to be the skin of the neck and/or the dorso-lateral thoracic and lumbar regions. In the male, atrophy of the testicles may be seen.

Histologically, the skin changes are "hyperkeratosis, keratrophy of the stratum spinosum, keratinization and distension of the hair follicles, atrophy of the sebaceous and sweat glands and hypertrophy and hyperplasia with vacuolar degeneration of the erector pili muscles." (9)

Laboratory procedures available as diagnostic aids in hypothyroidism include serum cholesterol, I^{131} uptake, PBI (serum protein bound iodine) and BEI (butanol extractable iodine). While the I^{131} uptake and PBI tests are most significant, serum cholesterol determinations are the most practical. The serum cholesterol level varies inversely with thyroid function; i.e., hypothyroidism results in hypercholesteremia. (4, 7) It should be remembered that diet, hepatic and pancreatic diseases will also cause an elevation of the cholesterol level. Nevertheless, this remains the most readily available procedure. The normal cholesterol range in the dog is 125–250 mg.%. Elevations help to confirm a diagnosis of hypothyroidism. Decreased cholesterol levels may be used to judge the efficacy of treatment. In the hemogram, a normocytic normochromic anemia may be seen. The blood smear may show anisocytosis, polychromasia or nucleated red blood cells but is not alone diagnostic of hypothroidism. (2, 4)

THERAPY

Of the products mentioned previously, the use of desiccated thyroid is preferred by the author. However, excellent results have been reported using triiodothyronine. (5) A dosage of 2.5–25 mcg. of this product has been successfully employed.

With desiccated thyroid, a daily dosage of from 2 to 10 grains has been used, depending upon the size of the patient and severity of the condition. This dosage represents thyroid administration of from 3–4 grains per each 10 pounds of body weight per day, yielding about 0.3–0.4 mg. of thyroxine. Using this dosage, signs of hyperthyroidism have not been observed by the author in afflicted dogs. However, during therapy, signs of restlessness, gastro-intestinal disturbances and tachycardia should be carefully checked. Cardiac patients with hypothyroidism should receive half of the above dosage and increased by increments of ½ grain as necessary over a period of several weeks. It should also be remembered that cooler weather results in greater body demands for thyroid hormone. Concomitant administration of other hormones, such as testosterone, "anabolic regulators," such as Vigoral (Pitman-Moore), or lipotropine, such an Methischol (U. S. Vitamin) may be used if indicated.

Pruritis does not seem to be associated with hypothyroidism per se. It is occasionally seen in association with the condition and can be counteracted with corticosteroid therapy as indicated. Otitis externa is also a common associated finding.

Medicated shampoos, such as Mycodex (Massengill) or Fosteen (Pitman-Moore) are used as cleansing agents to reduce the scaliness and remove debris from the skin.

The author recalls a discussion several years ago in which it was stated that desiccated thyroid preparations have a short shelf life. However, it has been shown that the uncoated tablet retains its potency for at least 3½ years and the coated preparation for up to 17 years. (6)

It should be emphasized that most animals must remain on thyroid therapy for several weeks before an improvement is seen. After remission of the cutaneous changes, a lower maintenance dosage may be employed. Occasionally, exacerbations occur which usually respond to temporary increases of the dosage. Sometimes it is possible to entirely eliminate therapy after recovery.

SUMMARY

The thyroid hormones include mono- and di- iodotyrosine, thyroxin (T_4) and tri-

iodothyronine (T_3). Various products have been employed in the treatment of hypothyroidism, desiccated thyroid being the personal preference of the author. Serum cholesterol determinations are used as a diagnostic aid and as a gauge of effective therapy. Concomitant administration of other drugs may be indicated.

Case Reports

Two case reports are presented to elucidate the syndrome.

Case #1

A five year old, male miniature Poodle was presented showing generalized hyperkeratosis, thinning of the hair coat, obesity, marked hyperpigmentation of the right inguinal area, perineal area and tail head and testicular atrophy. The condition had been in existence for a year and a half and had been treated with a variety of medicaments, including medicated shampoos, corticosteroids, Fulvicin (Schering) and Cytobin (Norden). Otitis externa was also evident. Pruritis was noted in the inguinal area and ears.

Laboratory work showed the total white count and differential to be within normal range. The serum cholesterol level was 530 mg.%.

Therapy consisted of the administration of 5 grains desiccated thyroid (Parke-Davis) b.i.d., 5 mg. methyltestosterone b.i.d. and one Methischol capsule (U. S. Vitamin) daily. Antibiotic-cortisone preparations were used in the ears.

Two weeks after the initiation of therapy, the cholesterol level was 175 mg.%. Methischol and testosterone were discontinued at this time. Four weeks later, the cholesterol level was 234 mg.%. The dosage of thyroid was dropped to 5 grains daily and 6 months later maintained at 5 grains per week.

Fosteen shampoo (Pitman-Moore) was used as the cleansing agent. Systemic cortisone preparations were used as needed to control pruritis, which was not a serious problem and rapidly subsided. Near complete remission of the skin changes, including the otitis externa, was seen after six weeks therapy. The weight dropped to a more reasonable level and the owner reported the activity of the dog had returned to normal.

Case #2

A six year old, male miniature Schnauzer was admitted with a history of thin hair coat for about a year. The animal was obese, the skin was thick, dry and scaly with darkly pigmented papules and showing bilateral, symmetrical alopecia over the dorsal thoracic and lumbar areas. The activity of the animal had decreased during the progress of the disease. The condition was not pruritic.

The laboratory picture was as follows: total white cell count—14,800, differential: Segs.—10,000, bands—400, lymphocytes—2,900, eosinophils—1,300 and monocytes—200. Five nucleated red cells were observed. The serum cholesterol was 333 mg.%.

Five grains of desiccated thyroid (Parke-Davis) was administered b.i.d. Three weeks later, the animal was re-examined. The progress of the alopecia had been halted, evidence of new hair growth was present, the activity of the dog had improved and the serum cholesterol was 170 mg.%.

After two months, the dog was on a reduced thyroid level of 5 grains per week. A vitamin-mineral preparation, Unipet (Upjohn) was given throughout the course of treatment.

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